ATTACHMENT 8 TO SUPPLEMENTAL DECLARATION OF C. MICHAEL PFAU AND JULIE S. CHAMBERS

Posted: 1/15/00

New, Old Carriers Place Big Bets on ATM Switching

By Peter Lambert

Is broadband, integrated access changing carrier services and operations so much that an incumbent telephone company would replace its reliable, hundred-year-old switchinginfrastructure, or would a new competitive carrier take a leap of faith to deploy arelatively unproven, new class of switches made by manufacturers with names unheard of among a savvy customer pool? Is broadband, integrated access changing carrier services and operations so much that an incumbent telephone company would replace its reliable, hundred-year-old switching infrastructure, or would a new competitive carrier take a leap of faith to deploy a relatively unproven, new class of switches made by manufacturers with names unheard of among a savvy customer pool?

Over the past several months, a number of real-world service providers in North America have begun to do just this. They are driven in great part by the emergence of integrated access devices (IADs) and broadband, digital subscriber line (DSL) access equipment--technologies that promise to alter the economics of both long distance and local telephony and to make resale and arbitrage of the advanced broadband and integrated access services a difficult proposition.

IADs and broadband access appear to be

HOT NEWS

04/19/2000

Nortel Acquires Architel for $395 Million

04/17/2000

Global Crossing Deploys Lucent Switch

04/13/2000

British Telecom Evolves with Changing Environment

04/12/2000

Dow Jones, RateXchange Create Index to Measure Bandwidth Prices

GTX Opens Exchange Points in New York, London

More Hot News

accelerating the urgency to migrate from circuit-switched networks to packet-switched networks that can support toll-quality voice. To these pioneer carriers, that means ATM packet switching. Since the driving forces behind their ATM strategies--particularly IADs and DSL--are proliferating worldwide, many carriers outside North America are likely to follow suit.

Among the U.S. pioneers, Bell operating company (RBOC) SBC Communications Inc. (www.sbc.com), in the closing weeks of 1999, committed US$6 billion to a radical overhaul of its infrastructure. Among DSL leaders worldwide with more than 100,000 lines, SBC is determined to make DSL available to 80 percent of its customers and, concurrently over the next several years, to scrap its entire circuit-switched, tandem trunking network in favor of voice trunking over ATM (VToA).

SBC's $6-billion Project Pronto "represents the kind of fundamental change that only comes every 60 years," says Sam Sigarto, executive director, ATM distribution network systems, broadband switching for SBC.

Yet, at the same time, Global NAPs Inc. (www.globalnaps.com), a relatively new U.S. backbone carrier with a much shorter history, also committed late in 1999 to migrating all its traffic to VToA. In another case, U.S.-based next-generation CLEC 2nd Century Communications Inc. (www.2c2.com) began to bring IADs and ATM telephony to customer doorsteps in the local loop. Further, the link between broadband access and packet-service integration can extend beyond DSL. In Los Angeles, AirPower Communications Inc. (www.airpower.net), an emerging wireless broadband, local multipoint distribution service (LMDS) carrier, also is breaking with convention and experimenting with integrating all its services over new Dynamic Transfer Mode (DTM) switching, a wholly new packet-transport technology from Dynarc Inc. (www.dynarc.com).

The links among DSL deployments, local integrated access services and ATM switching may be most evident in SBC's Project Pronto. For the asymmetric DSL (ADSL) data services already deployed in SBC's local loops, the transport technology is already ATM. Although Sigarto says "the jury is still out" on whether DSL voice traffic also will travel over ATM

virtual circuits (VCs) in the local loop, both voice and data certainly will travel over ATM transport in SBC's backbones.

Because ATM has statistical multiplexing capability--that is, the ability to have multiple services dynamically share the same bandwidth--the new ATM backbone promises to raise SBC's trunking bandwidth utilization from about 60 percent to approximately 90 percent, part of the reason the carrier expects the new infrastructure will generate US$1.5 billion in capital and operating expenses annually, Sigarto says. "You can leverage statistical multiplexing to gain efficiency transporting bursty data traffic as well, but voice alone looks like it could pay for the investment in ATM trunking."

"The opportunity to gain these kinds of savings and flexible service capabilities is worldwide," says Claude Romans, director of loop access for industry analyst Ryan Hankin Kent (www.rhk.com).

Indeed, SBC is not alone in deploying DSL systems for integrated voice and data around the world. According to Paris-based Alcatel (www.alcatel.com), although SBC, BellSouth Corp. (www.bellsouth.com) and other U.S. carriers accounted for about 80 percent of Alcatel's 1 million ADSL lines shipped by last November, the rapidly growing Asia-Pacific market accounted for 15 percent of the Alcatel ADSL lines shipped in 1999, while Europe, where ADSL deployments are just now getting underway, contributed 5 percent. Alcatel customers outside North America now include Bell Canada (www.bell.ca), Belgacom (www.belacom.be), British Telecom plc (BT, www.bt.com), France Telecom (www.francetelecom.fr), P.T. Telcom of Indonesia, Singapore Telecom International (www.singtel.com), Telefonica in Spain (www.telefonica.es), Telecom Italia (www.telecomitalia.it) and Telia in Sweden (www.telia.se).

As with SBC, Global NAPs' selection of ATM for integrated services transport was driven by capital and operational cost savings. Specializing in providing bulk lines to ISPs including Microsoft Corp.'s MSN (www.microsoft.com) and Mindspring Inc. (www.mindspring.net), Global NAPs expects to kill two birds with one stone in the form of a US$50-million deal to buy 75 Integrated

Convergence Switches (ICSs) from Convergent Networks Inc. (www.convergentnet.com).

First, the Convergent ICS can lower costs per DS-0 voice circuit from the US$200-US$300 range to US$25, "so I'm effectively going to cover 10 times more new markets than I could with more [Nortel Networks] DMS 500 [Class 4 circuit] switches"--a boon to the company's plans to expand its national presence to 85 percent of U.S. markets in the next two years, says Global NAPs' CEO Frank Gangi.

Second, Convergent managed to carry live traffic within four hours after bringing its switch to Global NAPs' Boston office, while Nortel (www.nortelnetworks.com) could not claim the same for its DMS 500 after two months, Gangi says. "That shrinks my time to market from forever to basically zero."

At the same time, he adds, "the Convergent switch is a Swiss army knife that can help us migrate our entire network to ATM while also talking to any other network, whether IP or ATM or the public switched telephone network."

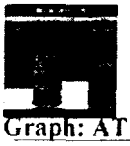
For both Global NAPs and SBC, integrating services onto one backbone with one, common transport infrastructure has become the most economic path.

"Is ATM optimized for voice?" asks SBC's Sigarto. "No, nor is it optimized for IP alone or video alone, but we need to build not six optimized networks for six separate services at six times the cost, but one network that can accommodate all those services, and ATM gives us the capability now to build that one network, and it may cost us 1 1/2 times what a single-service network would."

Match This

These changes in network fundamentals may raise the stakes for all carriers. In the United States., RBOCs in particular can call the technology tune, as they still provision well over 90 percent of all access lines, notes Tom Nolle, president of telecommunications consulting firm CIMI Corp. (www.cimicorp.com) Where new players Global NAPs and 2nd Century have committed US$50 million and US$30 million, respectively,

SBC will spend US$6 billion over the next several years. Other RBOCs have vowed to commit equally impressive war chests to transforming their networks to packet transport.



Graph: ATM Rides Last-Mile Integrated Access Wave

In short, the type of technology with which powerful U.S. RBOCs provision the preponderance of local lines--with ATM switches, IADs, and DSL access multiplexers (DSLAMs), for example--matters, in part because their volume purchases of equipment like ADSL modems drive international standards. Further, other carriers must compete with the incumbents' networks, in some cases unbundling incumbent equipment and systems for resale.

"It's well established that investment in packet technology can lower the costs of networking," Nolle says, "but that's meaningless if the savings gained can be wiped out by reseller arbitrage."

U.S. incumbents such as SBC gained relief from having to unbundle and wholesale packet services last September when the U.S. Federal Communications Commission (FCC, www.fcc.gov) issued a new unbundled network element (UNE) list--those pieces of the incumbent's networks that must be made available to competitors. Incumbent phone companies must continue to provide local loop access and other basic network elements, but they aren't required to offer competitors access to new high-speed data networking systems.

"By not requiring incumbent carriers to unbundle DSL equipment, the FCC recognizes the importance of facilities-based competitors," Steven Gorosh, general counsel of national, facilities-based DSL competitor NorthPoint Communications Inc. (www.northpointcom.com), said at the time. The decision, he added, will prompt further investment in facilities-based DSL deployment by both incumbents and competitors.

According to SBC's Sigarto, that ruling did play a small strategic role in SBC's decision to commit to its broadband network rebuild. "It was certainly one of the key attributes, but only

one among others," he says.

Yet even if the RBOCs eventually must unbundle their broadband network and service elements, Nolle says, ATM's elegant, dynamic bandwidth provisioning capabilities enable a facilities-based carrier to create services that are customized for each end user. The more customization, the more difficult for resellers to replicate without ATM facilities of their own.

Certainly, some new competitors are taking that facilities investment challenge. For example, while Global NAPs applies ATM to bulk line wholesale in its backbone, 2nd Century and Gabriel Communications Inc. (www.gabrielcom.net) are determined to effectively overbuild phone companies' circuit-switched local loops with integrated access networks based on ATM packet transport.

Sporting its own US$30-million contract with Convergent Networks, 2nd Century successfully completed interconnect testing last summer, carrying voice traffic between 2nd Century's ATM-based local exchange network and incumbent GTE Corp.'s (www.gte.com) facilities in Tampa, Fla., United States, all under the control of standard signaling system 7 (SS7). For its first local ATM telephone transmission, 2nd Century used Convergent's ICS in conjunction with VINA Technology Inc.'s (www.vina-tech.com) Multiservice Xchange (IAD) to encapsulate in ATM cells all voice, data and video at the customer site; then Advanced Switching Communications' (www.asc1.com) RBOX Multi-Service Aggregator aggregated traffic from those IADs, passing it to the ICS switch.

VINA, Accelerated Networks Inc. (www.acceleratednetworks.com), Sonoma Systems Inc. (www.sonoma-systems.com), Vertical Networks Inc. (www.getvertical.com) and other manufacturers believe the United States represents only the beginning for IADs. Last March, for example, VINA opened offices in Hong Kong and Reading, United Kingdom, to provide sales, marketing and technical support to customers and partners in Europe, the Middle East, Africa and Asia Pacific. Since last May, Berlin-based telecommunications equipment supplier DeTeWe (www.detewe.de) has been licensing and manufacturing Vertical Networks' integrated access systems for 17 European countries.

Although PTTs in Europe and Asia generally have not yet been forced to unbundle their local loops to competitors to the same extent as in the United States, RHK's Romans believes that competing carriers will begin to implement models wherein the end customer pays the PTT for DSL access but comes to the competitor for IADs and integrated services including VoDSL. "That is a viable model where you can't get direct access to the copper," he says, adding that such models will force the PTTs toward infrastructure overhauls like SBC's Project Pronto to make sure that competitors don't steal away the richest premium revenue opportunities.

If ATM promises to deliver voice quality, other technologies also must be applied to bring the feature-richness of integrated packet telephony services into parity with the legacy PSTN. Toward that end, ATM-based IAD makers are developing ways to deliver local calling features via IADs. Convergent, Sonoma and half a dozen IAD vendors have agreed to use the International Telecommunications Union's (ITU, www.itu.int) Q.2931 call control signaling standard and to implement Q.2931-to-SS7 interworking, enabling the translation of PSTN local call features to any local ATM system.

TeraBridge Technologies Corp. (www.terabridge.com) has launched an interoperability laboratory to prototype complex network signaling environments for vendors and carriers participating in the ATM Local Telephony Alliance (www.altainfo.org). Last summer, TeraBridge demonstrated an international voice call traveling from France to the United States using only ATM transport and TeraBridge's PathMinder software suite for call control session management.

"Call control is now decoupled from transport," says Seng Poh, vice president of technology and business development for Convergent. "So now you can define new features, program them on open softswitch servers, and have them run across any network that can be signaled."

Provisioning in Play

The emergence of DSL and other broadband access technologies, combined with packet

telephony technologies and customer requirements for delay-free voice services, make DSL and ATM natural bedfellows, according to ATM advocates, who note that many DSL systems already are driving ATM down to the customer premises.

Pitching ATM as the best quality assurance for packet voice over DSL (VoDSL) traffic, IAD makers are adding DSL interfaces and partnering with VoDSL gateway makers. "Service providers are saying they want to reduce costs but not at the expense of the customer's experience," says Matt Howard, vice president of marketing for Vertical Networks, which has partnered with several VoDSL gateway makers. "We expect it will be 18 months before a customer could go completely IP in the last mile."

Heidi Brandt, vice president of corporate marketing for Sonoma Systems, which like Vertical Networks has integrated PBX capabilities in its Sonoma Xchange IAD, agrees. "We just don't see service providers carrying IP services that require QoS except over ATM."

Indeed, according to industry researcher Cahners In-Stat Group (www.instat.com), IP telephony-based services are the key driver behind a rise in ATM investments by ISPs. Sales of wide-area ATM switches to service providers saw growth of 25 percent during the second quarter of 1999, growing from US$441 million to US$554 million--following only 3 percent growth in the first quarter of the year. Laurie Gooding, senior analyst with Cahners In-Stat, predicted ATM switching and voice over IP (VoIP) gateways would see parallel growth throughout 1999.

Whether it travels as VoIP over DSL or as VoIP over ATM over DSL, new VoDSL that supplies up to 16 voice circuits per customer "will increase the need to connect with a switch that can talk with the PSTN, and that can either be a US$5-million Class 5 switch or a US$500,000 next-generation, class-independent switch like ours," says Dan Simpkins, president and CEO for Salix Technologies Inc. (www.salix.com), maker of class-independent switches that constitute large-scale voice-over-any-transport gateways.

And whatever the underlying transport, integrated voice and data access requires the

ability to route multiple services over a single pipe and to provision bandwidth, encryption, firewall, filtering and any number of other network resources on a per session basis.

"The urgent need for dynamic, rapid provisioning systems is in the metropolitan area, where broadband access will push capacity requirements from kilobits to megabits per user," says Olov Schagerlund, CEO for Dynarc, whose DTM switches provide a "thin layer" between optical and IP networks for transport of integrated services. "You must have a transport layer that makes it easy to provision new services, because service providers will need to launch and relaunch new services, experimenting to find the killer application."

2nd Century, Gabriel Communications, Global NAPs and SBC, as well as Sprint Corp. (www.sprint.com), with its Integrated On-Demand Network (ION), all have decided that ATM provides that dynamic provisioning, as well as fail-safe traffic engineering and QoS guarantees on a per-connection basis.

However, IP advocates such as backbone Terabit Switch Router-maker Avici Systems Inc. (www.avici.com), argue that routers are the logical nexus for packet service provisioning. "We believe the dynamic provisioning solution lies ultimately with intelligent routing directly into optical wavelengths or via optical cross-connects, because the router is the device with visibility into the data stream," says Pete Chadwick, vice president of product marketing for Avici.

Still emerging from the Internet Engineering Task Force (IETF, www.ietf.org) and in product development among both router and switch makers, a multiprotocol label switching (MPLS) standard proposes to enable ATM-like VCs between points on IP networks. "There's a lot of interest in learning to do traffic engineering via MPLS, and to have that interwork with optical provisioning systems," Chadwick says. "One service provider tells us it expects to have terabit routing at its edge and all optical switching of huge capacity in its core, so there are a range of visions in play."

For the first time in service-provider local loop history, ATM has become the lens for one of those visions.

Peter Lambert is features editor for PHONE+ International.

ATTACHMENT 9 TO SUPPLEMENTAL DECLARATION OF C. MICHAEL PFAU AND JULIE S. CHAMBERS

EX PARTE OR LATE FILED

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April 6, 2000

Ms. Magalie Roman Salas
Secretary, Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: *Deployment of Wireline Services Offering Advanced Telecommunications Capability* -- CC Docket No. 98-147

Ex parte presentation pursuant to C.F.R. §1.1206(a)(1)

Dear Ms. Salas:

Catena Networks, Inc. ("Catena") met yesterday afternoon with Michelle Carey, Margaret Egler, Jake Jennings and Julie Patterson of the Policy and Program Planning Division of the Common Carrier Bureau. Jim Hjartarson, Gary Bolton and the undersigned counsel for Catena attended the meeting on behalf of Catena. During the meeting, Catena addressed its products and deployment of those products in the network. Some of those discussions touched on issues raised in the above-captioned proceeding.

Attached hereto for inclusion in the record are two copies of the materials that were discussed and passed out at the meeting. Please contact the undersigned if you have any questions with regard to this submission.

Respectfully submitted,

Stephen L. Goodman
Counsel for Catena

cc (w/o enc): Michelle Carey
Margaret Egler
Jake Jennings
Julie Patterson

Catena Networks

Broadband enabling every telephone line on Earth

Ex parte Presentation

Docket No. ___

Gary Bolton
Vice President, Product Marketing
April 5, 2000

Network Trends

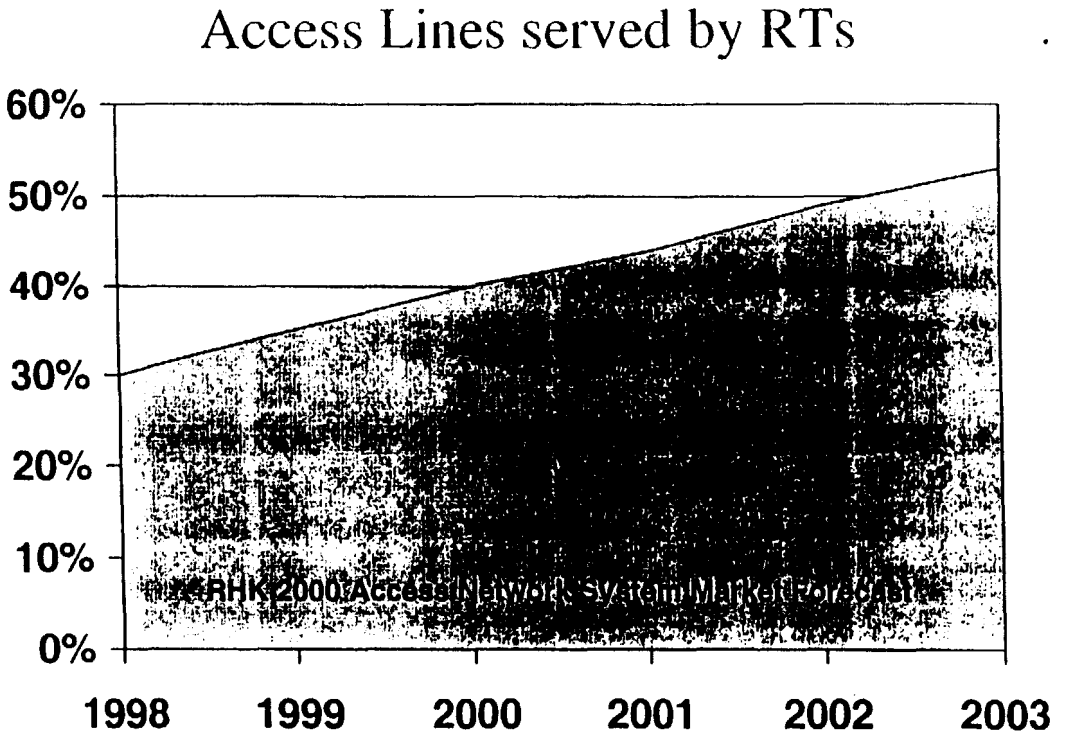
- **Over 50% of the traffic on today's Voice network is Data**
  - Growth of Internet had driven the demand for Advanced Services
  - The existing reliable circuit switched Voice Network is not designed to handle bursty Data traffic
    - 36CCS analog modem traffic severely impacts Networks designed for 4-6CCS

- **The Voice and Data networks are converging**
  - 37 new companies developing the Packet Class 4/5 Replacement Soft Switches (VON 3/00)
  - Voice can be delivered in the Data traffic - Derived Voice via Voice over DSL technologies

- **Integration of Voice and Data is critical to driving down cost, speeding deployment**
  - Integration of separate access elements is the foundation for cost reduction in network architectures

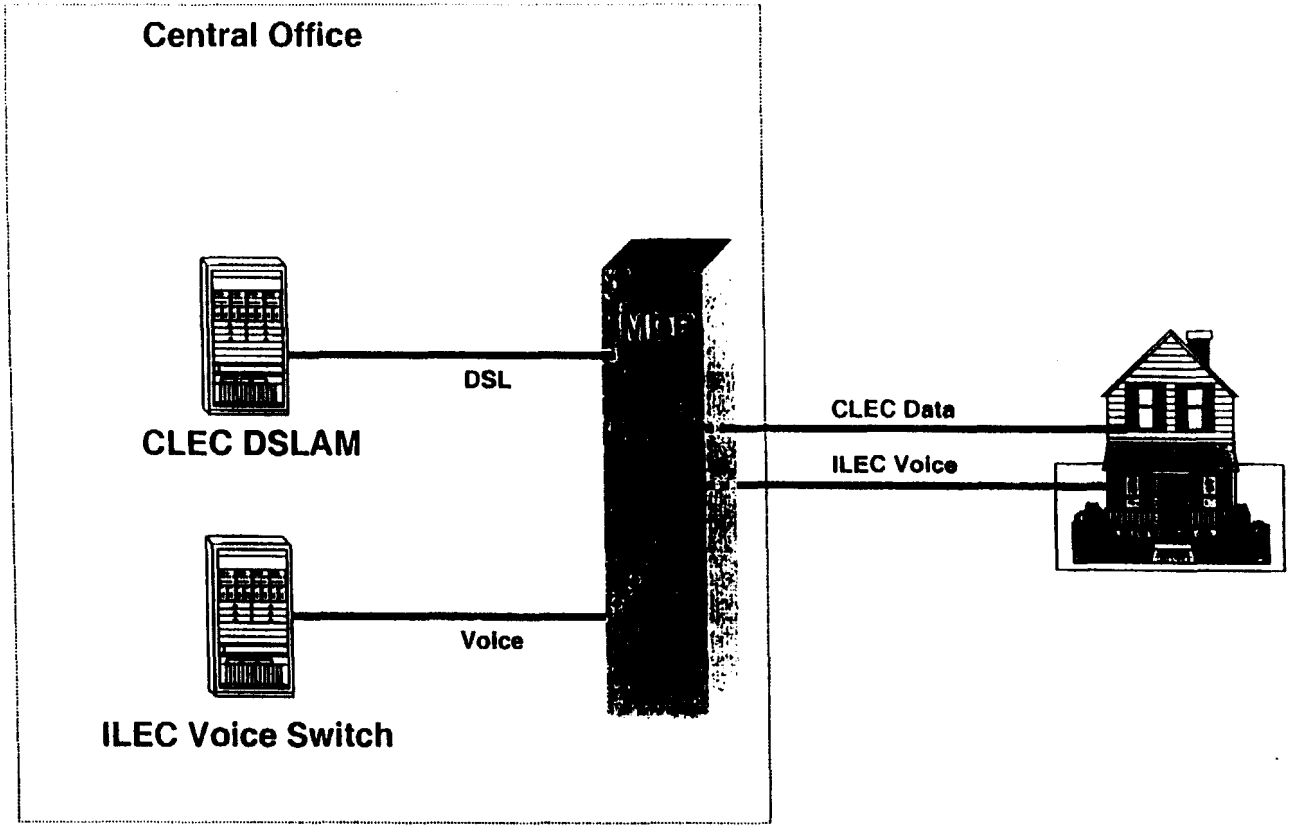
- **Investment in technology innovation is growing exponentially**
  - $13.4B venture funding was poured into Silicon Valley companies in 1999 (San Jose Mercury News 2/6/00)
    - $5.68B was invested in 358 companies in 4Q99 alone (vs previous 1yr record of $4.5B for all of 1998)
    - ***".....the Internet remains the driving force."***

Access Trends

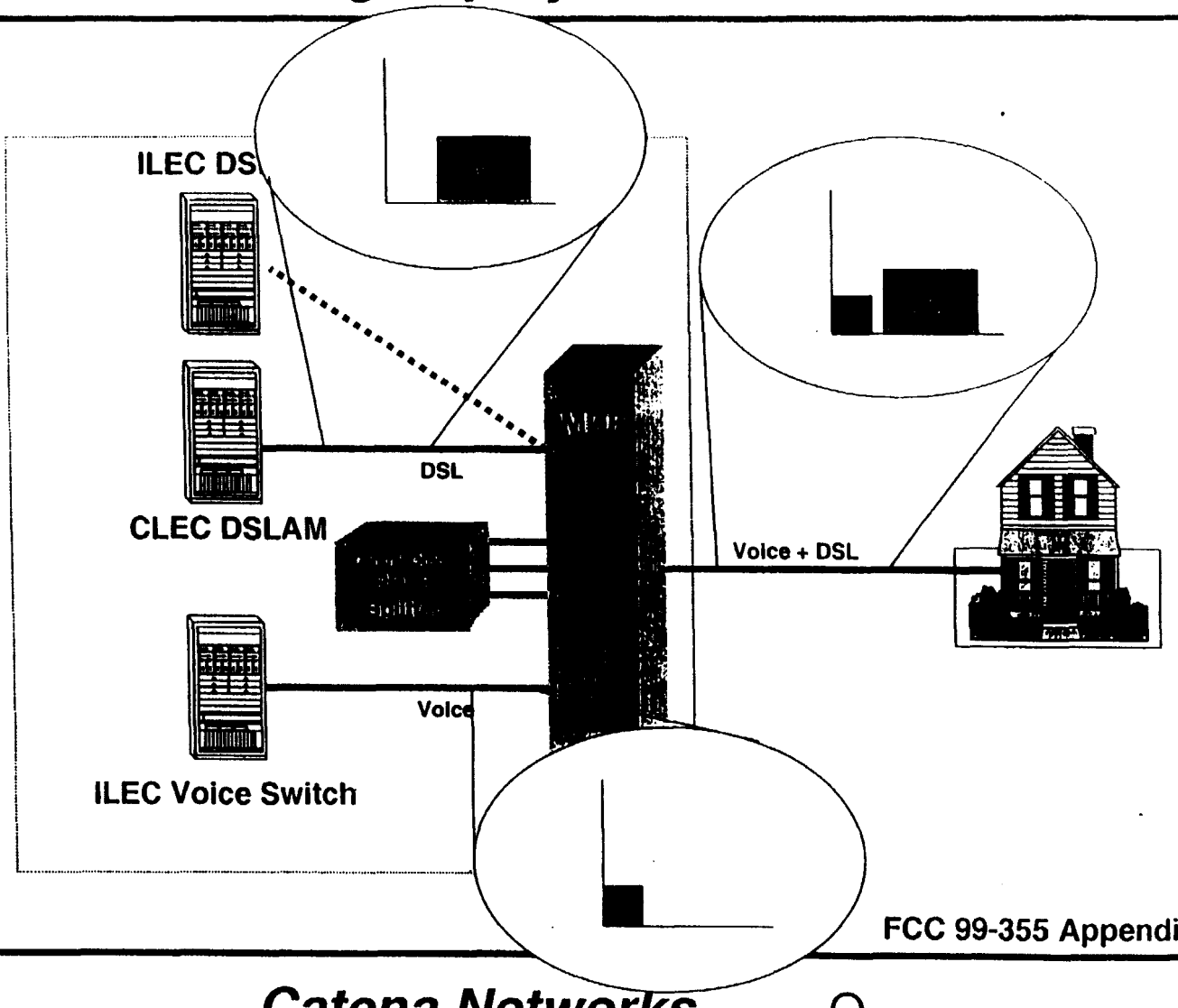


Within 3 years, the major of subscribers will be served off Remote Terminals (RTs)

Before Line Sharing



FCC's Line Sharing Deployment Model



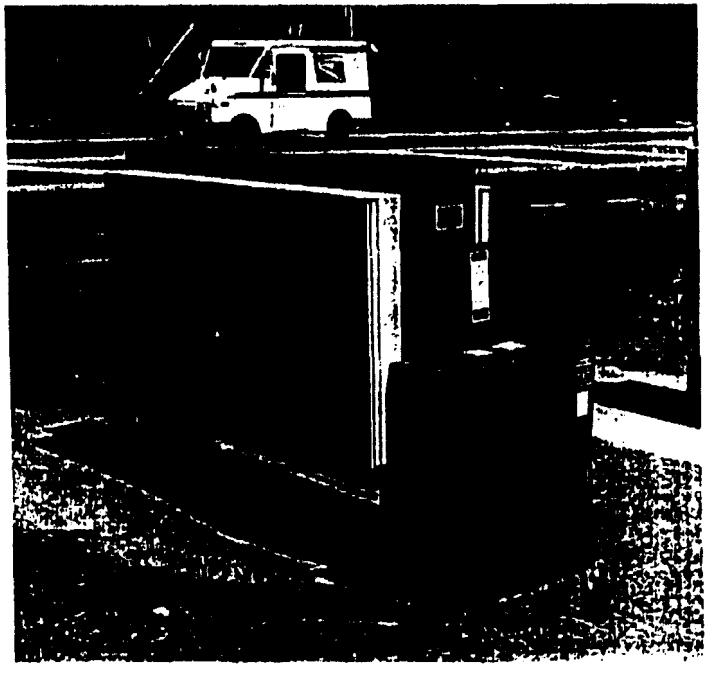
FCC 99-355 Appendix C

Catena Networks

What about Digital Loop Carriers (DLCs)?

DLCs deployed for "pair gain" benefits

- **Over 35% of subscribers are served off DLC**
- **Over 60% of new lines deployed**
- **50% of the target ADSL subscribers are served off DLCs**

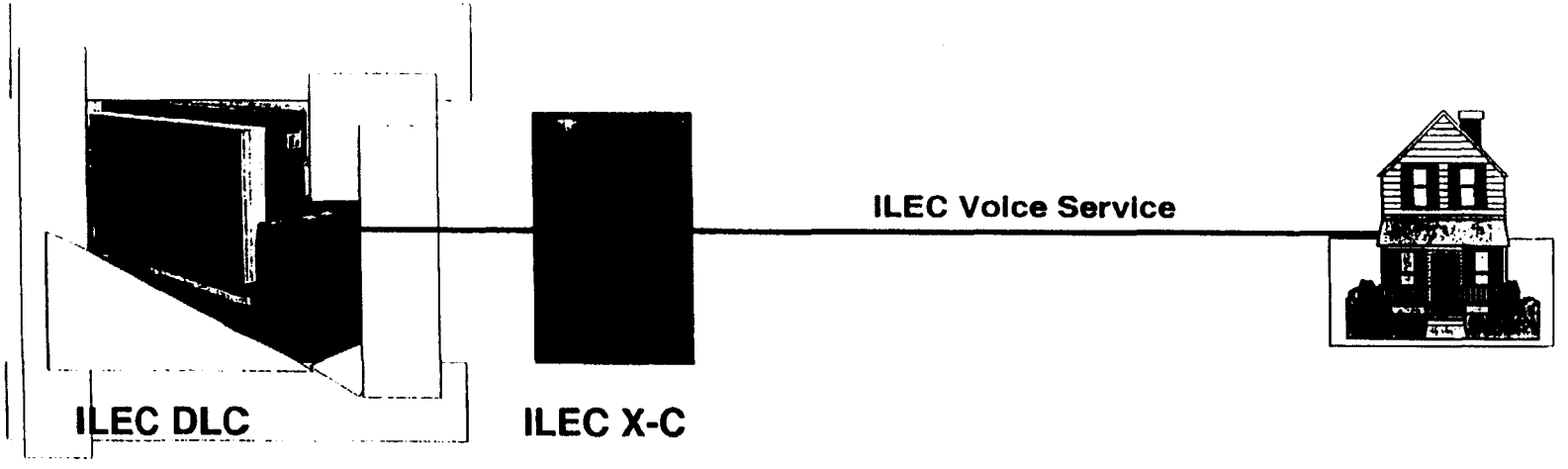


ADSL solution required in DLCs to address mass market

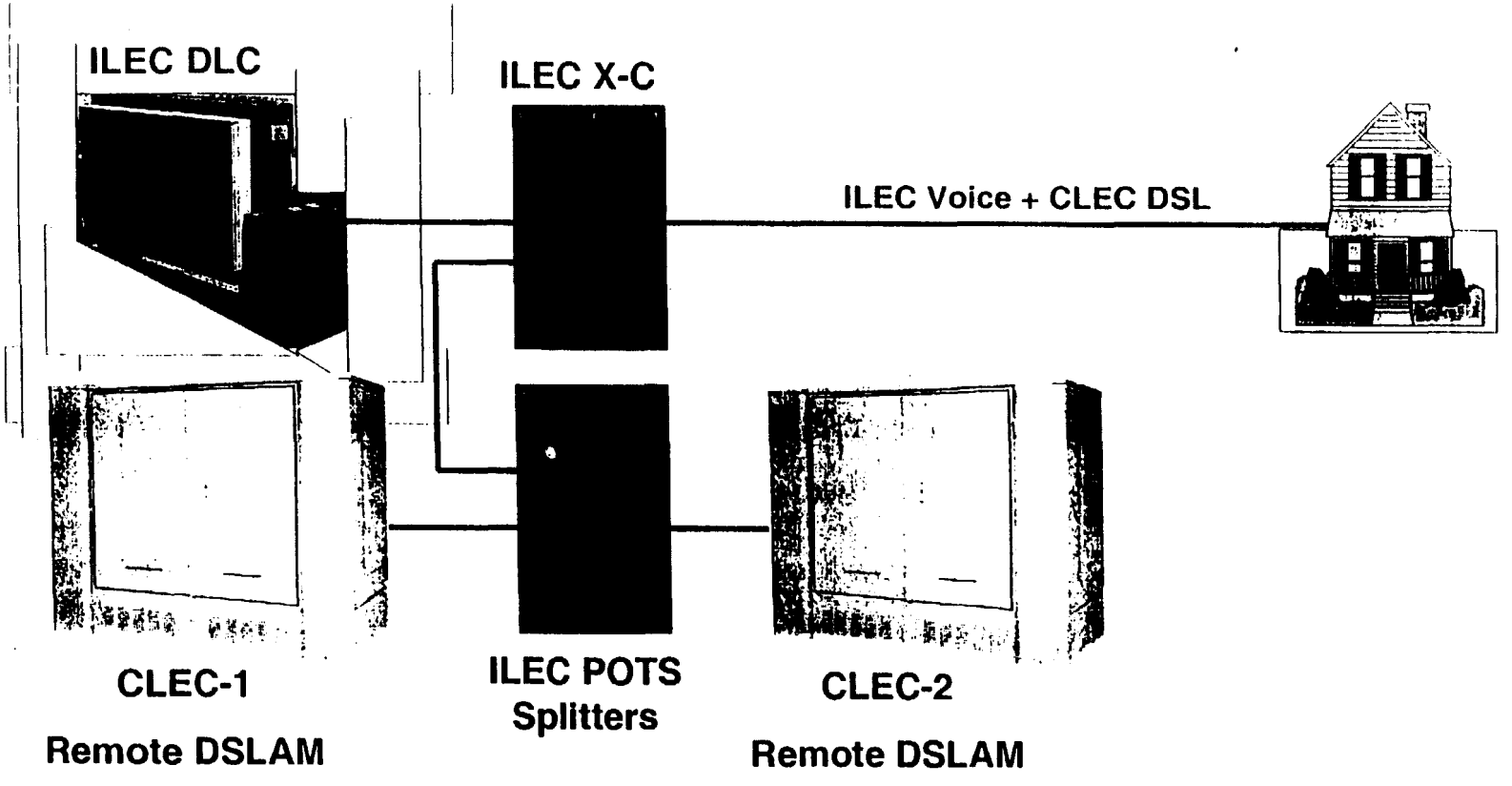
Sources:

RHK, Ovum, Americas Network

Today's DLC Deployment Model



Implementing Line Sharing on DLCs



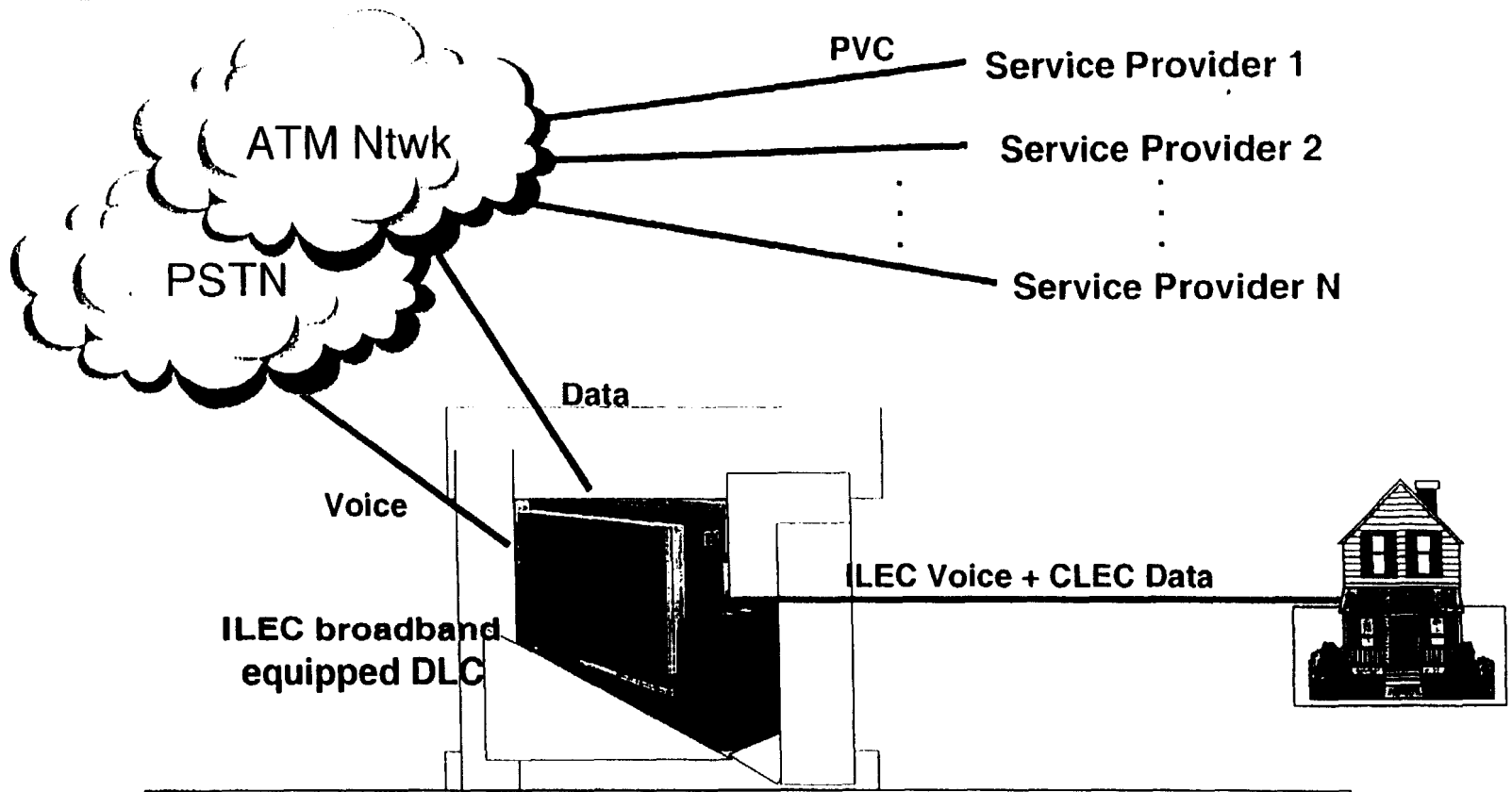
DLC Line Sharing Issues

- **Limited Availability of Real Estate**
  - Right Of Way constraints
  - Esthetics
  - Cabinet Farm at the edge of neighborhoods

- **Cost Prohibitive to CLEC**
  - Addressing limited number of subscribers (vs. Central Office application)
  - Cost up to $80K for OSP Cabinet, pour concrete slab and installation (not including the electronics!)
  - Expensive back haul facilities (for limited number of subscribers)

Physical Line Sharing is <u>not</u> practical in most DLC applications

Virtual Unbundling



Service Providers share common facilities (speeds deployment, minimizes cost)

Catena Networks

Broadband Equipped DLCs

New Installations:

- 3GDLCs can be provisioned with integrated Voice+DSL line cards

Legacy DLCs:

- Swap out existing POTS line card with integrated Voice+DSL line cards and ATM uplink card

DLC space, power and cost constraints can be addressed with integrated Voice+DSL line cards

Virtual Co-location

- CLEC provides Integrated Voice+DSL line card to ILEC
- ILEC installs plug in DLC
- CLEC provisions, monitors and maintains DSL service via partitioned EMS interface
- DSL traffic is routed thru the ATM network and delivered to the CLEC via PVC

Conclusions

- **Millions of *target* DSL subscribers are served off DLCs**

- **Physical Line Sharing is <u>not</u> practical in many DLC applications**
  - Separate Voice, DSLAM and POTS Splitter facilities are not practical when:
    - Space, Power, Cost are at a premium
    - Competing for limited number of subscribers (small serving areas)

- **Integrated Voice+DSL Line Cards will be implemented in DLCs**
  - Speed DSL deployment
  - Maximize economic efficiencies

Key Considerations

Guiding Principles

- **The FCC seeks to promote competition and accelerate widespread deployment of affordable advanced services to all Americans; Congress explicitly adopted this policy in section 706 of the 1996 Act**
- **The subscriber is the target beneficiary of this laudable policy**

Key Considerations

- **Network evolution is driving to the packetization of voice and data services**
- **Integration of Access elements is fundamental to driving down cost and accelerating widespread deployment**
  - Integrated POTS+ADSL solutions in RTs provide significant technical and economic efficiencies (vs overlay solutions)
- **Mechanical POTS Splitters strand 27KHz of premium bandwidth and add unnecessary cost and complexity to the access network**
- **Policy should allow maximum flexibility for the market place to leverage competitive technology innovations to maximize network economic efficiencies**
  - The FCC should not allow or encourage single vendor solutions, limiting competition and innovation

Recommendations

Access Network Evolution

- **As fiber is pushed deeper in towards the subscriber, the number of subscribers per RT decreases.**
  - The economic and practical incentives for multiple service providers to amortize the subscribers over common RT and back-haul facilities significantly increases.

- **This approach allows services in the RT to be turned on and off remotely and electronically, thus minimizing network operations costs**
  - This will speed service deployment and accelerates multiple competitive service providers' access to the subscriber base

Recommendations

- **Integrated POTS + ADSL line cards are the most cost effective and network efficient means for deploying advanced services in Remote Terminals (RTs), reducing the barrier to entry for competitive access providers**
  - This approach allows the number of competing service providers in an RT to equal the number of loops terminated
  - The technology is feasible in many RT platforms including many legacy products.
  - Single vendor solutions are anti-competitive and limit technology innovation

- **Multiple back-haul topologies should be allowed to maximize network efficiency.**
  - Any ruling should allow for both integrated and separate voice and data back-haul facilities using multiple transmission technologies including T1,T3, Sonet and WDM fiber technologies.